EFFECT OF WOOD TYPE ON THE NUTRIENT COMPOSITION OF SMOKE-DRIED *Citharinus citharus*

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ABSTRACT
The effect of wood types on the nutrient composition of smoked dried fish was carried out using *Citharinus citharus*. The wood types used for the experiment were Neem, *Parkia* and *Terminalia*. The fish samples were smoked dried to constant weight under the same conditions using the three wood types. Proximate nutrient composition of the fish samples and phytochemical analysis of the wood types was determined. Sensory evaluation on the organoleptic properties of the smoked fish samples was also conducted using a test panel to determine the general acceptability of the fish products in relation to the wood type used. Result of the proximate nutrient composition showed that fish sample smoked dried with *Terminalia* had the highest percentage of protein followed by that of *Parkia*. Fat content was highest in the fish sample smoked dried with Neem tree. The result of the phytochemical analysis of the wood types revealed the presence of high levels of tannin in Neem, tannins and phenolic compounds in *Parkia*. Organoleptic evaluation of the products showed that the fish samples smoked dried with *Terminalia* had the highest general acceptability.

INTRODUCTION
The use of smoke from smoldering wood for the preservation of perishable foods dates back to civilization (Eyo, 1997, 2001). FAO (1996) and Bronwell (1985) reported that smoking of fish is an old method of curing or preserving fish. Fish smoke curing result in change of colour, flavour and texture of the fish. According to Eyo (1992) smoking is the major method of fish preservation in Nigeria. Lin *et al.* (2008) also reported that smoking is widely used in fish processing for the color and flavour. Smoke is produced by a not complete burning of some type of wood and is a mixture of more than a hundred chemical components. The chemical composition of smoke depends on the type of wood and deciduous tree wood is used (FAO 1981, Clifford *et al.* 1980). Eyo (1985) reported the various kinds of woods in the tropics suitable for fish smoking process. In view of the importance of fish smoke-drying process involving the use of various wood types. This study was conducted to assess the effect of wood types on the nutrient content of *Citharinus citharus* a commercially important freshwater fish species in Lake Kainji – Nigeria.

MATERIALS AND METHODS
Samples of freshly caught fish were scaled, gutted and thoroughly washed before dividing into three treatments of 1kg each. Smoking was done to constant weight using Neem, *Parkia* and *Terminalia* woods respectively on Chorkor Banda smoking kiln. Moisture, crude, protein, ash, crude fibre, crude lipid, tannin and phenolic compounds were determined using standard procedures of AOAC (2000). Organoleptic evaluation was carried out using a 10-man trained panel through a 5-point hedonic scale to evaluate changes in flavour, colour, firmness of muscle, aroma and general acceptability.

RESULTS AND DISCUSSION
Results of the proximate nutrient composition of fish (Table 1) using the various wood types showed some degree of variation in the nutrient content of the fish samples especially protein and fat which were significantly different in *Terminalia* wood at 0.001level of significance. Negligible differences were observed in other nutrients among the three wood types. Nitrogen free extract was absent in all the samples. However, crude protein was highest in fish sample smoked dried with *Terminalia* wood while fat was the lowest. FAO (1981) reported variation in nutrient composition of selected fish species using different wood types. Eyo (1998) and Mumba and Jose (2005) reported similar findings.

Table I: Proximate composition of fish samples using various wood types.

Nutrient	Neem	*Parkia*	*Terminalia*
Crude protein	43.73[b]	44.49[b]	49.92[a]
Crude fat	19.84[a]	18.95[a]	15.77[b]
Ash	29.11	28.35	28.14
Crude fibre	1.05	1.20	1.16
Moisture	5.74	6.02	5.31

Table 2 shows the result of the phyto-chemical analysis of the various wood types used. Result showed the presence of tannins and Phenolic compounds in Parkia, tannins in Neem tree while terminalia had neither of these compounds. This might possibly explain the high percentage of protein in the experimental fish sample smoked-dried with Terminalia wood. Andrezey *et al.* (2005) reported the presence of polycyclic aromatic hydrocarbons deposited from wood smoke on fish while Rosa et al., (2007) reported the presence of volatile compounds in smoke –dried salmon. It appear from these findings that tannins affect the protein content in the smoked fish sample (Tables 1 and 2).

Table 2: Phytochemical Analysis of wood types.

Wood type	Tannin	Phenolic compounds
Neem	+++	-
Parkia	+	++
Terminalia	-	-

The organoleptic evaluation in Table 3 showed significant difference on the general acceptability of fish sample smoked dried using terminalia wood. Eyo (1985) reported significance difference in flavour and firmness of muscle from smoked-dried *Orechromis niloticus* using terminalia wood. He reported that *Afzelia africana* gave objectable colour and flavours to the fish. Balogun and Sumbella (2001) in their report indicated that wood type affect the colour and flavour of smoked dried fish samples. The findings from this study showed that wood type has effect on the nutrient composition of smoked dried fish. For the health of consumers, it may be necessary for fish processors to take into consideration the wood types used in fish smoking process.

Table 3: Organoleptic evaluation of fish samples using various wood types.

Wood type	SENSORY PARAMETERS				
	Flavour	Colour	Firmness	Aroma	General acceptability
Neem	4.19	4.52	4.57	4.23	3.66^{b}
Parkia	4.38	4.38	4.14	4.42	3.71^{b}
Terminalia	4.66	4.47	4.57	4.52	4.56^{a}

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